WHAT IS CLAIMED IS:

1    1.    A method for configuring multiple resources in a system, comprising:

2        providing a plurality of elements capable of configuring resources in the system,

3    wherein each element specifies configuration parameters to use to configure instances of

4    the resource, and wherein each resource is capable of being configured by multiple

5    elements that provide a different configuration of the resource;

6        maintaining service information indicating at least one service attribute that

7    results from the configuration of the resource by the element;

8        receiving at least one specified service attribute for a configuration;

9        determining at least one element for each resource having service information

10   indicating at least one performance and availability attribute that satisfies the at least one

11   administrator specified service attribute;

12       determining resource instances capable of being configured by the determined

13   elements; and

14       using the determined elements to configure the selected resource instances to

15   implement the specified service attributes.


1    2.    The method of claim 1, further comprising:

2        receiving information indicating a specified host from the administrator for which

3    the resources will be configured, and wherein the configured resource instances are used

4    by the specified host.


1    3.    The method of claim 1, wherein at least one resource to configure

2    comprises a storage resource, wherein storage elements are capable of providing different

3    configurations of the storage resources, further comprising:

4        determining total available storage space at the determined storage resource

5    instances;

6        presenting information on the total available storage space; and

7    receiving administrator input in response to the presented information indicating

8    selected storage space less than the available storage space to allocate.


1    4.    The method of claim 3, further comprising:

2    determining storage resource instances capable of being configured by the

3    determined storage element to allocate the administrator selected storage space.


1    5.    The method of claim 1, wherein at least one resource comprises a switch,

2    wherein the service information for switch elements that configure the switch resource

3    indicates a data throughput of the switch, wherein the administrator specified service

4    attribute indicates a specified data throughput, wherein the determined switch element

5    has service information that satisfies the specified data throughput, and wherein the

6    determined switch element configures at least one switch instance to provide the

7    specified  data throughput.


1    6.    The method of claim 1, wherein at least one resource comprises a host

2    adaptor in a host, wherein the resources are being configured for use by the host, wherein

3    the service information for switch elements that configure the switch resource indicates

4    one of multiple availability levels, wherein the administrator specified service attribute

5    indicates a specified availability level, wherein the determined host adaptor element has

6    service information that satisfies the specified availability level, and wherein the

7    determined host adaptor element configures at least one host adaptor instance in the host

8    to provide the administrator specified availability level.


1    7.    The method of claim 6, wherein the administrator specified availability

2    level defines redundant paths from the host to storage resources, and wherein the

3    determined host adaptor element configures multiple host adaptors in the host to enable

4    multiple paths to communicate with the storage resource.

1      8.     The method of claim 1, wherein at least one resource comprises a switch,

2  wherein the service attributes in the service information for switch elements that

3  configure the switch resource indicates an availability level indicating whether redundant

4  switch components are provided with the configuration, wherein the administrator

5  specified service attribute indicates one specified availability level, wherein the

6  determined switch element has service information that satisfies the specified availability

7  level, and wherein the determined switch element configures switch components to

8  provide the specified availability level.

1      9.     The method of claim 1, wherein at least one of the determined resources

2  comprises a storage resource, wherein the service information associated with storage

3  elements that configure the storage resource includes at least one service attribute

4  indicating an availability attribute, wherein the administrator specified service attributes

5  for the storage resource indicates one specified availability level, and wherein the

6  selected storage element that configures the storage resource has service information that

7  satisfies the administrator specified availability level.

1     10.    The method of claim 1, wherein the resources to configure are members of

2  the set of configurable resources comprising a host adaptor, switch, storage resource,

3  virtualization appliance, volume manager, and snapshot program.

1     11.    The method of claim 1, wherein the resources to configure include a host

2  adaptor, switch, and storage device, wherein the administrator specified service attribute

3  includes one of a first availability option, second availability option, and third availability

4  option, wherein the first availability option does not define any data and hardware

5  redundancy, wherein the second availability option defines data redundancy for the

6  configured storage device, and wherein the third availability option defines data

7  redundancy of the configured storage device and redundancy of at least one other switch

8  or host adaptor component.

1     12.    The method of claim 1, wherein the administrator specified at least one

2    service attribute indicates availability and performance for the host adaptor, switch, and

3    storage devices to configure for a host, and wherein the determined elements for

4    configuring the host adaptor, switch, and storage devices have service information that

5    satisfies the administrator specified availability and performance attributes for the host

6    adaptor, switch, and storage device.


1     13.    The method of claim 1, wherein the administrator specified service

2    attribute indicates to provide a redundant instance of at least one resource, and wherein at

3    least one determined element has service information indicating a redundant instance of

4    the at least one resource indicated as redundant by the administrator specified

5    availability.


1     14.    The method of claim 1, further comprising:

2    registering, with each element, a proxy object including interfaces used to access

3    the element with a lookup service, wherein the proxy object includes the service

4    information, and wherein the elements are used to configure the selected resources by

5    using the interfaces for the elements maintained in the element proxy objects.


1     15.    A method for configuring storage resources in a system, comprising:

2    providing a plurality of storage elements capable of configuring the storage

3    resources in the system, wherein each storage element specifies configuration parameters

4    to use to configure the storage resource;

5    maintaining service information indicating at least one storage attribute resulting

6    from the configuration by the element;

7    receiving at least one administrator specified service attribute for the

8    configuration of the storage resource;

9    determining one storage element having service information indicating at least

10    one service attribute that satisfies the administrator specified service attribute;

11    determining storage resource instances capable of being configured by the

12    determined element; and

13    using the determined storage element to configure the determined storage

14    resources to implement the specified service attributes.


1    16.    The method of claim 15, wherein the administrator specified service

2    attribute indicates a level of data redundancy for the storage resource to configure.


1    17.    The method of claim 15, wherein the at least one service attribute in the

2    service information indicates at least one performance and availability attribute resulting

3    from the configuration of the resource by the element.


1    18.    The method of claim 15, wherein the configurable storage resources

2    comprise virtualization appliances.


1    19.    A system for configuring multiple resources, comprising:

2    a plurality of configurable resources;

3    means for providing a plurality of elements capable of configuring the resources

4    in the system, wherein each element specifies configuration parameters to use to

5    configure instances of the resource, and wherein each resource is capable of being

6    configured by multiple elements that provide a different configuration of the resource;

7    means for maintaining service information indicating at least one service attribute

8    that results from the configuration of the resource by the element;

9    means for receiving at least one specified service attribute for a configuration;

10    means for determining at least one element for each resource having service

11    information indicating at least one performance and availability attribute that satisfies the

12    at least one administrator specified service attribute;

13    means for determining resource instances capable of being configured by the

14    determined elements; and

15       means for using the determined elements to configure the selected resource

16   instances to implement the specified service attributes.

1       20.     The system of claim 19, further comprising:

2       means for receiving information indicating a specified host from the administrator

3   for which the resources will be configured, and wherein the configured resource

4   instances are used by the specified host.

1       21.     The system of claim 19, wherein at least one resource to configure

2   comprises a storage resource, wherein storage elements are capable of providing different

3   configurations of the storage resources, further comprising:

4       means for determining total available storage space at the determined storage

5   resource instances;

6       means for presenting information on the total available storage space; and

7       means for receiving administrator input in response to the presented information

8   indicating selected storage space less than the available storage space to allocate.

1       22.     The system of claim 21, further comprising:

2       means for determining storage resource instances capable of being configured by

3   the determined storage element to allocate the administrator selected storage space.

1       23.     The system of claim 19, wherein at least one resource comprises a switch,

2   wherein the service information for switch elements that configure the switch resource

3   indicates a data throughput of the switch, wherein the administrator specified service

4   attribute indicates a specified data throughput, wherein the determined switch element

5   has service information that satisfies the specified data throughput, and wherein the

6   determined switch element configures at least one switch instance to provide the

7   specified data throughput.

1     24.    The system of claim 19, wherein at least one resource comprises a host

2    adaptor in a host, wherein the resources are being configured for use by the host, wherein

3    the service information for switch elements that configure the switch resource indicates

4    one of multiple availability levels, wherein the administrator specified service attribute

5    indicates a specified availability level, wherein the determined host adaptor element has

6    service information that satisfies the specified availability level, and wherein the

7    determined host adaptor element configures at least one host adaptor instance in the host

8    to provide the administrator specified availability level.

1     25.    The system of claim 24, wherein the administrator specified availability

2    level defines redundant paths from the host to storage resources, and wherein the

3    determined host adaptor element configures multiple host adaptors in the host to enable

4    multiple paths to communicate with the storage resource.

1     26.    The system of claim 19, wherein at least one resource comprises a switch,

2    wherein the service attributes in the service information for switch elements that

3    configure the switch resource indicates an availability level indicating whether redundant

4    switch components are provided with the configuration, wherein the administrator

5    specified service attribute indicates one specified availability level, wherein the

6    determined switch element has service information that satisfies the specified availability

7    level, and wherein the determined switch element configures switch components to

8    provide the specified availability level.

1     27.    The system of claim 19, wherein at least one of the determined resources

2    comprises a storage resource, wherein the service information associated with storage

3    elements that configure the storage resource includes at least one service attribute

4    indicating an availability attribute, wherein the administrator specified service attributes

5    for the storage resource indicates one specified availability level, and wherein the

6   selected storage element that configures the storage resource has service information that

7   satisfies the administrator specified availability level.

1      28.    The system of claim 19, wherein the resources to configure are members

2   of the set of configurable resources comprising a host adaptor, switch, storage resource,

3   virtualization appliance, volume manager, and snapshot program.

1      29.    The system of claim 19, wherein the resources to configure include a host

2   adaptor, switch, and storage device, wherein the administrator specified service attribute

3   includes one of a first availability option, second availability option, and third availability

4   option, wherein the first availability option does not define any data and hardware

5   redundancy, wherein the second availability option defines data redundancy for the

6   configured storage device, and wherein the third availability option defines data

7   redundancy of the configured storage device and redundancy of at least one other switch

8   or host adaptor component.

1      30.    The system of claim 19, wherein the administrator specified at least one

2   service attribute indicates availability and performance for the host adaptor, switch, and

3   storage devices to configure for a host, and wherein the determined elements for

4   configuring the host adaptor, switch, and storage devices have service information that

5   satisfies the administrator specified availability and performance attributes for the host

6   adaptor, switch, and storage device.

1      31.    The system of claim 19, wherein the administrator specified service

2   attribute indicates to provide a redundant instance of at least one resource, and wherein at

3   least one determined element has service information indicating a redundant instance of

4   the at least one resource indicated as redundant by the administrator specified

5   availability.

1      32.     The system of claim 19, further comprising:

2      a lookup server including lookup service;

3      means for registering, for each element, a proxy object including interfaces used

4   to access the element with the lookup service, wherein the proxy object includes the

5   service information, and wherein the elements are used to configure the selected

6   resources by using the interfaces for the elements maintained in the element proxy

7   objects.


1      33.     A system for configuring storage resources in a system, comprising:

2      storage resources;

3      means for providing a plurality of storage elements capable of configuring the

4   storage resources in the system, wherein each storage element specifies configuration

5   parameters to use to configure the storage resource;

6      means for maintaining service information indicating at least one storage attribute

7   resulting from the configuration by the element;

8      means for receiving at least one administrator specified service attribute for the

9   configuration of the storage resource;

10     means for determining one storage element having service information indicating

11   at least one service attribute that satisfies the administrator specified service attribute;

12     means for determining storage resource instances capable of being configured by

13   the determined element; and

14     means for using the determined storage element to configure the determined

15   storage resources to implement the specified service attributes.


1      34.     The system of claim 33, wherein the administrator specified service

2   attribute indicates a level of data redundancy for the storage resource to configure.

1      35.    The system of claim 33, wherein the at least one service attribute in the

2   service information indicates at least one performance and availability attribute resulting

3   from the configuration of the resource by the element.


1      36.    The method of claim 33, wherein the configurable storage resources

2   include virtualization appliances.


1      37.    An article of manufacture including code for configuring multiple

2   resources in a system, wherein the code causes operations comprising:

3        providing a plurality of elements capable of configuring resources in the system,

4   wherein each element specifies configuration parameters to use to configure instances of

5   the resource, and wherein each resource is capable of being configured by multiple

6   elements that provide a different configuration of the resource;

7        maintaining service information indicating at least one service attribute that

8   results from the configuration of the resource by the element;

9        receiving at least one specified service attribute for a configuration;

10       determining at least one element for each resource having service information

11   indicating at least one performance and availability attribute that satisfies the at least one

12   administrator specified service attribute;

13       determining resource instances capable of being configured by the determined

14   elements; and

15       using the determined elements to configure the selected resource instances to

16   implement the specified service attributes.


1      38.    The article of manufacture of claim 37, wherein the code further causes

2   operations comprising:

3        receiving information indicating a specified host from the administrator for which

4   the resources will be configured, and wherein the configured resource instances are used

5   by the specified host.

1       39.     The article of manufacture of claim 37, wherein at least one resource to

2   configure comprises a storage resource, wherein storage elements are capable of

3   providing different configurations of the storage resources, wherein the code further

4   causes operations comprising:

5       determining total available storage space at the determined storage resource

6   instances;

7       presenting information on the total available storage space; and

8       receiving administrator input in response to the presented information indicating

9   selected storage space less than the available storage space to allocate.

1       40.     The article of manufacture of claim 39, wherein the code further causes

2   operations comprising:

3       determining storage resource instances capable of being configured by the

4   determined storage element to allocate the administrator selected storage space.

1       41.     The article of manufacture of claim 37, wherein at least one resource

2   comprises a switch, wherein the service information for switch elements that configure

3   the switch resource indicates a data throughput of the switch, wherein the administrator

4   specified service attribute indicates a specified data throughput, wherein the determined

5   switch element has service information that satisfies the specified data throughput, and

6   wherein the determined switch element configures at least one switch instance to provide

7   the specified data throughput.

1       42.     The article of manufacture of claim 37, wherein at least one resource

2   comprises a host adaptor in a host, wherein the resources are being configured for use by

3   the host, wherein the service information for switch elements that configure the switch

4   resource indicates one of multiple availability levels, wherein the administrator specified

5   service attribute indicates a specified availability level, wherein the determined host

6   adaptor element has service information that satisfies the specified availability level, and

7   wherein the determined host adaptor element configures at least one host adaptor instance

8   in the host to provide the administrator specified availability level.

1       43.    The article of manufacture of claim 42, wherein the administrator

2   specified availability level defines redundant paths from the host to storage resources,

3   and wherein the determined host adaptor element configures multiple host adaptors in the

4   host to enable multiple paths to communicate with the storage resource.

1       44.    The article of manufacture of claim 37, wherein at least one resource

2   comprises a switch, wherein the service attributes in the service information for switch

3   elements that configure the switch resource indicates an availability level indicating

4   whether redundant switch components are provided with the configuration, wherein the

5   administrator specified service attribute indicates one specified availability level, wherein

6   the determined switch element has service information that satisfies the specified

7   availability level, and wherein the determined switch element configures switch

8   components to provide the specified availability level.

1       45.    The article of manufacture of claim 37, wherein at least one of the

2   determined resources comprises a storage resource, wherein the service information

3   associated with storage elements that configure the storage resource includes at least one

4   service attribute indicating an availability attribute, wherein the administrator specified

5   service attributes for the storage resource indicates one specified availability level, and

6   wherein the selected storage element that configures the storage resource has service

7   information that satisfies the administrator specified availability level.

1       46.    The article of manufacture of claim 37, wherein the resources to configure

2   are members of the set of configurable resources comprising a host adaptor, switch,

3   storage resource, virtualization appliance, volume manager, and snapshot program.

1    47.    The article of manufacture of claim 37, wherein the resources to configure

2    include a host adaptor, switch, and storage device, wherein the administrator specified

3    service attribute includes one of a first availability option, second availability option, and

4    third availability option, wherein the first availability option does not define any data and

5    hardware redundancy, wherein the second availability option defines data redundancy for

6    the configured storage device, and wherein the third availability option defines data

7    redundancy of the configured storage device and redundancy of at least one other switch

8    or host adaptor component.

1    48.    The article of manufacture of claim 37, wherein the administrator

2    specified at least one service attribute indicates availability and performance for the host

3    adaptor, switch, and storage devices to configure for a host, and wherein the determined

4    elements for configuring the host adaptor, switch, and storage devices have service

5    information that satisfies the administrator specified availability and performance

6    attributes for the host adaptor, switch, and storage device.

1    49.    The article of manufacture of claim 37, wherein the administrator

2    specified service attribute indicates to provide a redundant instance of at least one

3    resource, and wherein at least one determined element has service information indicating

4    a redundant instance of the at least one resource indicated as redundant by the

5    administrator specified availability.

1    50.    The article of manufacture of claim 37, wherein the code further causes

2    operations comprising:

3        registering, with each element, a proxy object including interfaces used to access

4    the element with a lookup service, wherein the proxy object includes the service

5    information, and wherein the elements are used to configure the selected resources by

6    using the interfaces for the elements maintained in the element proxy objects.

1      51.    An article of manufacture for configuring storage resources in a system,

2    wherein the code causes operations comprising:

3        providing a plurality of storage elements capable of configuring the storage

4    resources in the system, wherein each storage element specifies configuration parameters

5    to use to configure the storage resource;

6        maintaining service information indicating at least one storage attribute resulting

7    from the configuration by the element;

8        receiving at least one administrator specified service attribute for the

9    configuration of the storage resource;

10      determining one storage element having service information indicating at least

11    one service attribute that satisfies the administrator specified service attribute;

12      determining storage resource instances capable of being configured by the

13    determined element; and

14      using the determined storage element to configure the determined storage

15    resources to implement the specified service attributes.

1      52.    The article of manufacture of claim 51, wherein the administrator

2    specified service attribute indicates a level of data redundancy for the storage resource to

3    configure.

1      53.    The article of manufacture of claim 51, wherein the at least one service

2    attribute in the service information indicates at least one performance and availability

3    attribute resulting from the configuration of the resource by the element.

1      54.    The article of manufacture of claim 51, wherein the configurable storage

2    resources comprise virtualization appliances.